Advanced Mirror Material System, Phase II Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)

ABSTRACT

Peregrine will bring together recent laboratory developments and mature the technology so that complete mirror and telescope assemblies can be reliably and robustly produced. This proposed innovation will lower the cost of space mirrors from their current state of the art of $6.4 M/m2 to less than $1.6 M/m2 while maintaining low weight, high stiffness and high performance for x-ray, neutron and UV/optical mirrors. The basis of this approach relies upon Be-38Al (a lower cost beryllium) to create a substrate, the use of coefficient of thermal expansion (CTE) matching phosphorous containing electroless nickel plating (NiP) to establish an amorphous surface, and then single point diamond turning (SPDT) that surface to a precision optical figure out to the edge of the substrate. Be-38Al provides a substrate material that can provide the same stiffness as beryllium because it is not limited by its fracture sensitivity like beryllium. Electroless nickel applied to Be-38Al with the right phosphorous content can match the Be-38Al's CTE, and the use of diamond turning can readily produce optical surfaces that can be used as is or with final polishing.

ANTICIPATED BENEFITS

To NASA funded missions:

Potential NASA Commercial Applications: Potential uses, first and most obvious are for the applications currently under consideration for NASA large optical systems. That in and of itself will be a substantial technological success that will enable the advancement of the current state of the art of this innovative material system. In addition, this technology will be adaptable to other satellite programs like: -Astrophysics applications that require large aperture, lightweight and highly reflective mirrors that can operate down to cryogenic temperatures. -Lightweight x-ray imaging mirrors for future large advanced x-ray observatories. -Could enhance programs like AFTA/WFIRST, JUICE, ASTRO, EVI and possibly Euclid.

Advanced Mirror Material System

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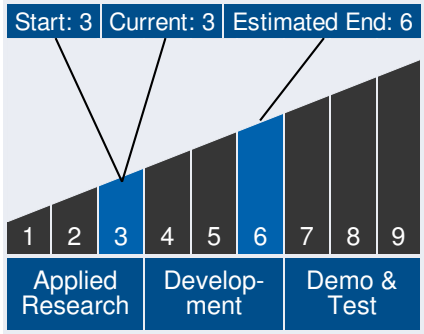
Technology Maturity



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

Program Manager:

- Carlos Torrez

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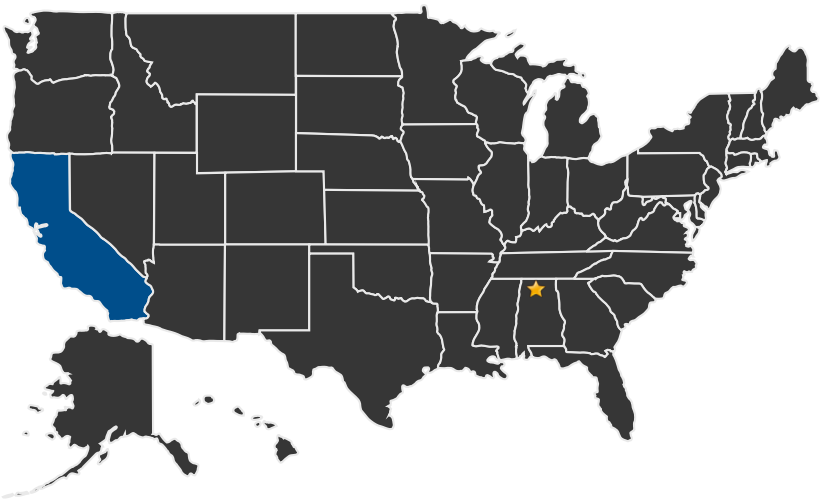
To the commercial space industry:

Potential Non-NASA Commercial Applications: This advanced material system as it applies to mirrors for both UV/optical and x-ray optics can be applied to many research and development applications here on earth. Fast scan mirrors and surveillance systems rely upon low density, high stiffness and high performance optics. This material system can provide solutions. In addition, commercial and military optical systems, particularly Earth observation satellites like Google Earth and other systems could benefit from this technology.

U.S. WORK LOCATIONS AND KEY PARTNERS



U.S. States With Work

Lead Center:
Marshall Space Flight Center

Other Organizations Performing Work:

- The Peregrine Falcon Corporation (Pleasanton, CA)

Management Team *(cont.)*

Principal Investigator:

- Robert Hardesty

Technology Areas

Primary Technology Area:
Materials, Structures, Mechanical Systems and Manufacturing (TA 12)
- Manufacturing (TA 12.4)
  - Electronics and Optics Manufacturing Process (TA 12.4.3)
    - Optics Fabrication (TA 12.4.3.2)

Secondary Technology Area:
Science Instruments, Observatories, and Sensor Systems (TA 8)
- Observatories (TA 8.2)
  - Mirror Systems (TA 8.2.1)

PROJECT LIBRARY

Presentations

- Briefing Chart
  - (http://techport.nasa.gov:80/file/18177)

DETAILS FOR TECHNOLOGY 1

Technology Title

Advanced Mirror Material System